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BRIEF NOTE

LIMNETIC LARVAL FISH IN THE NEARSHORE ZONE OF THE SOUTH SHORE OF THE CENTRAL BASIN OF LAKE ERIE[1]

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There are few published reports of larval fish studies in the central basin of Lake Erie. The first in this region is the pioneer work of Fish (1932). Studies which follow are recent efforts concentrated in limited areas and are often presented in impact assessment reports having limited circulation. This report presents the results of a survey of larval fish in the nearshore zone of the central basin of Lake Erie from Conneaut to Sandusky, Ohio.

Larval fish were sampled at 10 transects during each of 8 cruise periods between 2 May and 9 August 1978. Four replicate samples were collected at 3 stations along each transect that was perpendicular to the shoreline. Stations were located at the 1-2 m depth contour (samples were not collected at this station for a transect in Cleveland Harbor where this depth was absent) and offshore at the 5 and 10-m depth contours.

Oblique composite-strata tows were made at night with conventional plankton nets (0.75-m diameter, 0.571-mm mesh, conical design). The nets were towed in a circular pattern to avoid propwash. Tows of 3 min were conducted at speeds of 2-5 knots. Flow rates were measured with calibrated General Oceanics flowmeters.

Field collections were preserved in buffered 5% formalin solution. Larvae from each sample were identified to species where possible, counted and measured for total length. Developmental stages were identified according to definitions of Hubbs (1943). Several species, which are morphologically similar during their early developmental stages, could not be separated efficiently. Gizzard shad (*Dorosoma cepedianum*) and alewife (*Alosa pseudoharengus*) were grouped and reported as gizzard shad/alewife. Common carp (*Cyprinus carpio*) and goldfish (*Carassius auratus*) larvae and their hybrids were similarly grouped and reported as carp/goldfish. Black crappie (*Pomoxis nigro-*

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maculatus) and white crappie (*P. annularis*) are reported as crappie. All sunfish specimens collected are reported as sunfish (*Lepomis* spp.).

Concentrations of fish larvae were calculated on the basis of the number of larvae collected in each tow and the volume of water filtered, as computed from flowmeter data. Mean density of each species group was calculated and expressed as numbers of larvae per 100 m^3. Friedman's statistical tests (Hollander and Wolfe 1973) were performed to detect differences among densities of the 9 most abundant species groups at each of the 3 depth intervals extending offshore and between longshore transects. Differences in mean densities were considered to be statistically significant at the $\alpha = 0.05$ level, unless noted at the $\alpha = 0.01$ level.

Of the 25 taxa collected (table 1), larval clupeids, emerald shiner (*Notropis atherinoides*) and spottail shiner (*N. hudsonius*) comprised 82.4% of the larval fish captured. Rainbow smelt (*Osmerus mordax*), carp/goldfish, and freshwater drum (*Aplodinotus grunniens*) comprised an additional 10.9% of the total. Yellow perch (*Perca flavescens*), trout-perch (*Percopsis omiscomaycus*), and logperch (*Percina caprodes*) each comprised approximately 1% of the total. These species are listed in order of abundance in table 2.

Significant differences among densities at the 1-2, 5, and 10-m station depths are summarized in table 2. Differences

TABLE 1

Limnetic larval fish collected in the nearshore zone of the south shore of the central basin of Lake Erie during 1978.

Species*	First Capture	Last Capture	Period of Peak Abundance	Relative Abundance %	Avg. Density No./100 cu. m Prolarvae	Total Larvae
Dorosoma cepedianum/ *Alosa pseudoharengus*	17 May	5 August	Mid-June-early July	30.5	6.2	30.4
Coregonus clupeaformis	26 June	26 June	26 June	< 0.1	< 0.01	< 0.1
Osmerus mordax	14 May	6 August	Early-mid-June	3.7	0.2	5.2
Carpiodes cyprinus	21 May	16 June	Late May-early June	< 0.1	< 0.1	< 0.1
Moxostoma spp.	31 May	31 May	31 May	< 0.1	0.0	0.1
Catostomus commersoni	10 May	2 June	Mid-May	< 0.1	< 0.1	< 0.1
Cyprinus carpio/ *Carassius auratus*	22 May	6 August	Late June-early July	3.0	1.5	3.5
Notropis Atherinoides	31 May	6 August	Late June-early July	34.3	32.3	43.8
N. chrysocephalus	21 May	16 June	Late May-early June	< 0.1	< 0.1	< 0.1
N. hudsonius	21 May	4 August	Mid-June-mid-July	17.6	7.7	19.5
Lota lota	10 May	10 May	10 May	< 0.1	< 0.1	< 0.1
Percopsis omiscomaycus	10 May	4 July	Late May-mid-June	1.0	1.1	1.5
Morone chrysops	16 June	19 July	Mid-July	< 0.1	0.0	< 0.1
Pomoxis spp.	2 June	5 July	Mid-late June	< 0.1	< 0.1	< 0.1
Ambloplites rupestris	17 June	6 July	Late June-early July	< 0.1	< 0.1	< 0.1
Micropterus dolomieui	16 June	16 June	16 June	< 0.1	< 0.0	< 0.1
Lepomis spp.	17 May	4 August	Late June-mid-July	< 0.1	< 0.1	< 0.1
Stizostedion canadense	21 May	31 May	Late May	< 0.1	< 0.1	< 0.1
S. vitreum vitreum	10 May	6 July	Mid-May	< 0.1	< 0.1	< 0.1
Perca flavescens	17 May	16 July	Early-mid-June	1.3	1.6	1.8
Percina caprodes	17 May	6 August	Mid-late June	0.8	0.3	0.8
Etheostoma nigrum	1 June	30 July	Late June-early July	0.8	0.9	1.0
E. blennioides	1 June	5 June	5 June	< 0.1	< 0.1	< 0.1
Aplodinotus grunniens	5 June	4 August	Late June	4.2	1.5	1.6
Cottus spp.	21 May	2 June	Late May	0.5	0.12	0.59

*Scientific names assigned according to Robins et al. (1980)

TABLE 2

Inshore/offshore differences in larval fish densities captured at 3 depth intervals.

Species	1-2-m depth*		5-m depth		10-m depth	
	prolarvae	total larvae	prolarvae	total larvae	prolarvae	total larvae
Notropis atherinoides	−	−	−	−	−	−
Dorosoma cepedianum/ Alosa pseudoharengus	+	−	+	−	−	−
N. hudsonius	++	++	++	−	++	++
Aplodinotus grunniens	−	−	−	−	−	−
Osmerus mordax	−	−	−	−	−	−
Cyprinus carpio/ Carassius auratus	+	++	−	−	+	++
Perca flavescens	++	++	++	−	++	++
Percopsis omiscomaycus	++	++	−	−	++	++
Percina caprodes	−	−	−	−	−	−

*(−) no significant difference ($\alpha = 0.05$)
(+) significant difference ($\alpha = 0.05$)
(++) significant difference ($\alpha = 0.01$)

($\alpha = 0.01$) among nearshore (1-2 m) and offshore (10 m) densities of spottail shiner, carp/goldfish, yellow perch and trout-perch indicate immediate nearshore locations in water 1-2 m deep are the principal nursery areas for these species of fish. Differences among prolarval densities of spottail shiner and yellow perch at the 1-2-m and 5-m depths further reinforce the importance of the immediate nearshore zone as a nursery and, by extension, spawning area for these species. A relatively broad nursery area in the nearshore zone is indicated by the lack of significant differences among the densities of emerald shiner, freshwater drum, rainbow smelt, and logperch.

Significant differences were not detected between the 10 transects for prolarval or total larval densities of rainbow smelt, carp/goldfish, and logperch or for prolarval densities of spottail shiners and yellow perch. Densities of larval (prolarvae and total) clupeids, emerald shiner, and freshwater drum were significantly higher at transects located west of Cleveland than at transects located in the vicinity of Cleveland and further east. Mean densities of larval spottail shiner (total) and trout-perch (prolarvae and total) were significantly higher at transects located east of Cleveland. Larval fish densities were lowest, although seldom significantly, at the 2 transects located in the vicinity of Cleveland.

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LITERATURE CITED

Fish, M. P. 1932 Contributions to the early life histories of 62 species of fishes from Lake Erie and its tributaries. Fish Bull. 10: 298.

Hollander, M. and D. A. Wolfe 1973 Nonparametric statistical methods. J. Wiley & Sons, NY. p. 138-158.

Hubbs, C. L. 1943 Terminology of early stages of fishes. Copeia 1943: 260.

Robbins, C. R., R. M. Bailey, C. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea and W. B. Scott 1980 A list of common and scientific names of fishes from the United States and Canada. 4th Ed. Amr. Fishery Soc. Spec. Publ. No. 12. 176 p.